Optimized probing states for qubit phase estimation with general quantum noise

Titre	Optimized probing states for qubit phase estimation with general quantum noise
Type de publication	Article de revue
Auteur	Chapeau-Blondeau, François [1]
Editeur	American Physical Society
Type	Article scientifique dans une revue à comité de lecture
Année	2015
Langue	Anglais
Date	Mai 2015
Numéro	5
Pagination	052310
Volume	91
Titre de la revue	Physical Review A
ISSN	1050-2947
Résumé en anglais	We exploit the theory of quantum estimation to investigate quantum state estimation in the presence of noise. The quantum Fisher information is used to assess the estimation performance. For the qubit in Bloch representation, general expressions are derived for the quantum score and then for the quantum Fisher information. From this latter expression, it is proved that the Fisher information always increases with the purity of the measured qubit state. An arbitrary quantum noise affecting the qubit is taken into account for its impact on the Fisher information. The task is then specified to estimating the phase of a qubit in a rotation around an arbitrary axis, equivalent to estimating the phase of an arbitrary single-qubit quantum gate. The analysis enables determination of the optimal probing states best resistant to the noise, and proves that they always are pure states but need to be specifically matched to the noise. This optimization is worked out for several noise models important to the qubit. An adaptive scheme and a Bayesian approach are presented to handle phase-dependent solutions.
URL de la notice	http://okina.univ-angers.fr/publications/ua11344 [2]
DOI	10.1103/PhysRevA.91.052310 [3]
Lien vers le document	http://dx.doi.org/10.1103/PhysRevA.91.052310 [3]

Liens

[1] http://okina.univ-angers.fr/f.chapeau/publications
[2] http://okina.univ-angers.fr/publications/ua11344
[3] http://dx.doi.org/10.1103/PhysRevA.91.052310